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EXAMINER	
SHAH, PARAS D	
ART UNIT	**PAPER NUMBER**
2609	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/25/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/678,247	LASHKARI ET AL.	
	Examiner	Art Unit	
	Paras Shah	2609	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 October 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-33* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-33* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *10/03/2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This communication is in response to the Application filed on 10/03/2003.

Drawings

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "856" has been used to designate both finding the first LSPs and computation of optimum LSPs. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Petitions

3. The petition decision filed on 04/12/2004 for Figure 7C has been reviewed in light of the specification. The amended Figure 7C has been determined not to be new matter since the specification refers to Figure 7C and is fully supported in the specification by paragraphs [0113]-[0115].

Specification

4. The disclosure is objected to because of the following informalities: The reference that was incorporated in the specification stating "filed March 6, 2000" in page 3, [0009], line 3-4 should be "filed March 6, 2001."

Appropriate correction is required.

5. The disclosure is objected to because of the following informalities: The stated value of "16000 Hz" is incorrect on page 31, line 2 and should be corrected as "1600 Hz".

Appropriate correction is required.

Claim Objections

6. Claim 1 is objected to because of the following informalities: "a polynomial" in line 11 should be corrected to "the polynomial". Further, "a series" on line 12 should be corrected to "the series" Appropriate correction is required.

7. Claims 2, 16, and 26 are objected to because of the following informalities: "the root domain" in line 2 should be corrected to "a root domain".

8. Claim 4 is objected to because of the following informalities: "a polynomial" on line 1 should be corrected to "the polynomial". Appropriate correction is required.

9. Claim 5 is objected to because of the following informalities: "the line spectrum pair" on line 2 should be corrected to "a line spectrum pair". Further, the claim recites "the line spectrum frequency" in line 3 should be "a line spectrum frequency." Appropriate correction is required.

10. Claim 14 is objected to because of the following informalities: "a polynomial" in line 13 should be corrected to "the polynomial". Further, "a series" on line 14 should be corrected to "the series" Appropriate correction is required.

11. Claims 18 and 29 are objected to because of the following informalities: "the line spectrum pair" in line 3 and 2, respectively should be corrected to "a line spectrum pair".

12. Claim 19 is objected to because of the following informalities: "the line spectrum frequencies" in line 2, respectively should be corrected to "line spectrum frequencies".

13. Claim 25 is objected to because of the following informalities: "a polynomial" in line 13 should be corrected to "the polynomial". Further, "a series" on line 13 should be corrected to "the series" Appropriate correction is required.

14. Claims 3, 5-13, 15-17, 20-24, 27, 28, and 30-33 are objected to as being dependent upon an objected base claim.

Claim Rejections - 35 USC § 101

15. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 25-33 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. The claims stated above recites an article of manufacture for which recordable media is used. An "article of manufacture" represents the production of items or physical goods. Further, the Applicant regards recordable medium to include machine-readable medium and computer readable medium. Hence, machine recordable medium is being defined as also including propagated signals (see

[0038)). Propagated signals are a form of nonfunctional descriptive language and are nonstatutory. Therefore, the applicant is suggested to change the article of manufacture to computer readable medium.

Claim Rejections - 35 USC § 102

16. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

17. Claims 1, 14, and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Chen *et al.* ("A New Algorithm for Parameter Re-Optimization", 2000).

As to claims 1,14, and 25 Chu *et al.* discloses generating synthesized speech samples (see Abstract) (e.g. It is evident that in order to minimize the error between the original and synthesized speech, the synthesized speech must be generated), using a synthesis filter (see page 560, left column, sect I, lines 1-3), in response to an excitation signal (see page 560, left column, sect I, line 3 and lines 6-8); determining a synthesis error between original speech samples and the synthesized speech samples (see Abstract); and substantially reducing the synthesis error by computing both the

excitation signal and filter parameters for the synthesis filter (see page 560, left column, sect I, lines 1-8), wherein substantially reducing the synthesis error comprises applying a gradient descent algorithm (see page 561, left column, sect II, last paragraph) to a polynomial (see page 561, left column, sect II, the equation on the 2nd line) representing the synthesis error over a series of iterations (see page 561, left column, sect II, the equation on the 2nd line) (e.g. The summation bounds indicate that iterations must be performed to find the error over the bounds 1:N.), including computing a gradient of the synthesis error in terms of gradient vectors (see page 561, left column, sect II, last paragraph) of the synthesized speech samples by generating partial derivatives (see page 561, left column, sect II, equations 3, 4, and last paragraph), using a recursive algorithm (see page 561, left column, sect II, 3rd paragraph) , for terms of a polynomial representing the synthesized speech samples over a series of iterations (see page 561, left column, sect II, the equation on the 2nd line (e.g. The polynomial represents the synthesized and original speech. It is further noted that the subsequent equations shown in the reference perform partial derivatives with respect to the parameters (see equations 3 and 4)).

18. Claims 1-3, 9-16, and 22- 26 are rejected under 35 U.S.C. 102(e) as being anticipated by Chu *et al.* (US 2003/0204402).

The applied reference has a common inventor with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in

the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

As to claims 1,14, and 25 Chu *et al.* discloses generating synthesized speech samples (see Figure 1, output of element 16), using a synthesis filter (See Figure 1, element 16), in response to an excitation signal (see Figure 1, element 12); determining a synthesis error between original speech samples and the synthesized speech samples (see Figure 1, the subtraction of the output of 16 and 10); and substantially reducing the synthesis error by computing both the excitation signal and filter parameters for the synthesis filter (see [0018]), wherein substantially reducing the synthesis error comprises applying a gradient descent algorithm (see Figure 3) to a polynomial (see [0019]) representing the synthesis error over a series of iterations (see [0041]), including computing a gradient of the synthesis error in terms of gradient vectors of the synthesized speech samples by generating partial derivatives (see [0034]), using a recursive algorithm (see [0034]), for terms of a polynomial representing the synthesized speech samples over a series of iterations (see [0022]) (e.g. The polynomial is used for the recursive process).

As to claims 2, 3, 15,16 and 26 Chu *et al.* discloses wherein substantially reducing the synthesis error occurs in the root domain and the gradient descent algorithm is applied to roots of the polynomial (see [0030]) (e.g. It is apparent that the determination of the roots is one method used in optimization algorithms).

As to claims 9-11, 22 and 23, Chu *et al.* discloses further comprising adjusting a step-size (see [0054], lines 10-11 and [0040]) used in the gradient descent algorithm

(see equation 14) at each iteration to ensure that a minimum of the synthesis error is not overshot (e.g. Since the step size can be adjusted adaptively, it is inherent that the synthesis error would not be overshot) (see [0043]). Further, for claims 10, 11, and 23, it is inherent that the use of an adaptive step size will cause the step size to decrease for situations where the filter becomes unstable and changes for stable situations [see [0040] and [0043].

As to claim 12, Chu *et al.* discloses further comprising generating an excitation function (see Figure 1, element 12 and see [0016]).

As to claims 13 and 24, Chu *et al.* discloses wherein generating an excitation function comprises selecting the excitation function from a codebook of possible excitations (see [0044], line 14-16).

Claim Rejections - 35 USC § 103

19. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

20. Claims 4, 17, and 27 are rejected under 35 U.S.C. 103(a) as being obvious over Chu *et al.* as applied to claim 3, 16, and 25 above, in view of Rajesekaran *et al.* (US 4,922,539).

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

As to claims 4,17, and 27, Chu *et al.* discloses the finding of the roots of a polynomial representing the synthesis error (see [0019] and [0030]). However, Chu *et al.* does not specifically disclose the converting of linear predictive coefficients to roots. Rajesekaran *et al.* discloses converting linear predictive coefficients to roots (see col. 2, lines 62-65). It would have been obvious to one of ordinary skilled in the art at the time the invention was made to have modified the finding of roots from a polynomial presented by Chu *et al.* with the conversion of LPC coefficients to roots presented by of Rajesekaran *et al.* The motivation to have combined the two references involves the

determination of the formants of the vocal tract (see col. 1, lines 15-18), which would decrease the error between the synthesized and original speech.

21. Claims 5, 6, 8, 18, 19, 21, 29, 30-33 are rejected under 35 U.S.C. 103(a) as being obvious over Chu *et al.* as applied to claims 1, 18, and 25 above, in view of Morris *et al.* ("Modification of Formants in the Line spectrum Domain", January 2002).

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

As to claims 5,18, and 29, Chu *et al.* discloses reducing the synthesis error between original speech samples and synthesized speech using gradient descent algorithm (recursive algorithm). However, Chu *et al.* does not specifically disclose the

computation of partial derivatives with respect to line spectrum pairs. Morris *et al.* discloses the computation of partial derivatives representing speech with respect to line spectrum pairs (see page 19, equations 5-7 and equation 8). It would have been obvious to one of ordinary skilled in the art at the time the invention was made to have combined the reduction of synthesis error presented by Chu *et al.* with the use of partial derivative of the line spectral pair as presented by Morris *et al.* The motivation to have combined the two references involves LSP frequencies are commonly used in coding and are a representation of linear prediction coefficients (see page 19, right column, 2nd paragraph), which benefit the system taught by Chu *et al.*, where the LSP coefficients are found from the original and synthesized speech.

As to claims 6,19, and 30, Morris *et al.* discloses the LSPs comprise roots of a pair of polynomials (see page 19, equation 3 and 4) based in line spectrum frequencies (see page 19, right column, sect. II, part A., lines 10-11).

As to claims 8, 21, and 31, Chu *et al.* discloses the polynomial representing synthesized speech (see equation 3). However, Chu *et al.* does not specifically disclose the finding of the LSP of the polynomial. Morris *et al.* does disclose the finding of the LSP from speech and being represented by a polynomial (see page 19, right column, equations 1, 2). It would have been obvious to one of ordinary skilled in the art at the time the invention was made to have combined the polynomial for synthesized speech presented by Chu *et al.* with the determination of line spectral pair as presented by Morris *et al.* The motivation to have combined the two references involves LSP frequencies are commonly used in coding and are a representation of linear prediction

coefficients (see Morris *et al.* page 19, right column, 2nd paragraph), which benefit the system taught by Chu *et al.*, where the LSP coefficients are found from the original and synthesized speech.

As to claim 32, Chu *et al.* discloses the computation of the gradient of the synthesis error (see equations 12, and 13 and [0037], [0040], and [0041]. Morris *et al.* discloses the computation of partial derivatives representing speech with respect to line spectrum pairs (see page 19, equations 5-7 and equation 8). It would have been obvious to one of ordinary skilled in the art at the time the invention was made to have combined the computation of the gradient vector presented by Chu *et al.* with the use of partial derivative relative line spectral pair as presented by Morris *et al.* The motivation to have combined the two references involves LSP frequencies are commonly used in coding and are a representation of linear prediction coefficients (see page Morris *et al.* 19, right column, 2nd paragraph), which benefit the system taught by Chu *et al.*, where the LSP coefficients are found from the original and synthesized speech. Further, the use of partial derivatives is one technique used in computing gradients (see Chu *et al.* equation 7) (e.g. Partial derivatives are used to calculate J). The LP coefficients are used to calculate the synthesis error energy (see [0041]).

AS to claim 33, Chu *et al.* discloses applying a gradient descent algorithm (see Figure 3) to a polynomial (see [0019]) representing the synthesis error over a series of iterations (see [0041]), including computing a gradient of the synthesis error in terms of gradient vectors of the synthesized speech samples by generating partial derivatives (see [0034]), using a recursive algorithm (see [0034]), for terms of a polynomial

representing the synthesized speech samples over a series of iterations (see [0022]) (e.g. The polynomial is used for the recursive process). However, Chu *et al.* does not specifically disclose the finding of the LSP of the polynomial. Morris *et al.* does disclose the finding of the LSP from speech and being represented by a polynomial (see page 19, right column, equations 1, 2). It would have been obvious to one of ordinary skilled in the art at the time the invention was made to have combined the polynomial for synthesized speech presented by Chu *et al.* with the determination of line spectral pair as presented by Morris *et al.* The motivation to have combined the two references involves LSP frequencies are commonly used in coding and are a representation of linear prediction coefficients (see Morris *et al.* page 19, right column, 2nd paragraph), which benefit the system taught by Chu *et al.*, where the LSP coefficients are found from the original and synthesized speech.

22. Claims 7 and 20 are rejected under 35 U.S.C. 103(a) as being obvious over Chu *et al.* in view of Morris *et al.* as applied to claims 5 and 18, and 31 above, and further in view of Arslan *et al.* ("Voice Conversion by Codebook Mapping of Line Spectral Frequencies and Excitation Spectrum", 1997).

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject

matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

As to claims 7 and 20, Chu *et al.* and Morris *et al.* do not specifically disclose the use of gradient descent to optimize LSP for the excitation signal to reduce error between the original and synthesized speech samples. Arslan *et al.*, discloses the use of a gradient descent (see page 2, right column, lines 10-15) to optimize the LSF (see page 2, right column, lines 6-7 for the excitation signal (see page 1, right column, bottom two lines). However, Arslan *et al.* does not specifically disclose the optimization of LSP. It would have been obvious to one of ordinary skilled in the art at the time the invention was made to have combined the teachings of Chu *et al.* and Morris *et al.* with the use of the gradient descent algorithm for optimization on LSF and LSP as presented by Arslan *et al.* The motivation to have combined the two references involves the determination of the optimal set of weights that would represent the original speech spectrum (see Arslan *et al.* page 2, right column, lines 8-9). Further, since LSF and LSP are derived from the polynomial representing speech, it would be obvious to have

optimized the LSF and LSP coefficients to closely model the original speech as stated above.

Conclusion

23. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Willimann (US 3,909,533) and White (US 4,038,495) are cited to disclose the synthesis of speech signals. Liu *et al.* (US 4,975,956) and Grabb *et al.* (US 6,067,511) are cited to disclose a speech coder utilizing LPC parameters. Lashkari ("A new technique for joint optimization of excitation and model parameters in parametric speech coders") and Lashkari *et al.* ("Complete optimization of excitation and model parameters in parametric speech coders") are cited to disclose minimization of synthesis error using a gradient search for a given excitation.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paras Shah whose telephone number is (571)270-1650. The examiner can normally be reached on MON.-FRI. 7:30a.m.-5:00p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Xiao Wu can be reached on (571)272-7761. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

P.S.

04/16/2007

XIAO WU
SUPERVISORY PATENT EXAMINER